

Notice of Allowability

Application No.

10/052,020

Examiner

Carramah J. Quiett

Applicant(s)

CAHILL ET AL.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 11/03/2006.
2. ☒ The allowed claim(s) is/are 1-12, 23-29, 35 and 36.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413),
Paper No./Mail Date 20070117.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Robert Walker on January 16, 2007 at 2:39 pm.

The application has been amended as follows:

Claim 1 [Amended] An electronic imaging system for capturing an image of a scene, said imaging system comprising:

- (a) an optical system for producing an optical image of the scene;
 - (b) an imaging sensor having a surface in optical communication with the optical system;
- and
- (c) a plurality of imaging elements distributed on the surface of the imaging sensor, said imaging elements converting the optical image into a corresponding output image, said imaging elements being located according to a distribution representable by a nonlinear function in which ~~the~~ relative density of the distributed imaging elements is greater toward the center of the sensor, wherein the distribution provides physical coordinates for each of the imaging elements corresponding to a projection of the scene onto a non-planar surface, wherein said output image has a plurality of pixels, each said pixel corresponding to a respective one of said imaging elements;

wherein said optical system provides a perspective projection of said optical image onto said surface **of said imaging sensor**, wherein said optical image has a perspective distortion relative to said surface **of said imaging sensor**, said perspective distortion being inherent in geometry of said perspective projection onto said surface **of said imaging sensor**, and said distribution of said imaging elements on said surface of said imaging sensor compensates said output image for said perspective distortion, such that said output image is free of said perspective distortion and has said pixels in a uniform rectilinear array.

Claim 10 [Amended] The system of claim 1 wherein the output **signal image** includes data from a plurality of images.

Claim 11 [Amended] The system of claim 10 further including a processor for combining the images into a composite image, whereby the processor can operate directly on the output **signal image** without having to warp the image data.

Claim 23 [Amended] A method of generating a composite digital image from at least two source digital images, said method comprising:

providing a perspective projection of each of said source optical images onto a planar surface of an image sensor, wherein each of said source optical images has a perspective distortion relative to said surface, said perspective distortion being inherent in geometry of said perspective projection onto said surface, said image sensor having a plurality of imaging elements, said imaging elements **being located according to a distribution representable by a nonlinear function in which relative density of the distributed imaging elements is greater toward the center of the sensor, wherein the distribution provides physical coordinates for each of the imaging elements corresponding to a projection of the scene onto a non-planar**

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surface having a wherein said distribution of imaging elements on said surface ~~compensatory~~
compensates for said perspective distortion;

generating at least two source digital images corresponding to said optical images said
source digital images each having a plurality of pixels, each said pixel corresponding to a
respective one of said imaging elements, said pixels being in a uniform rectilinear array free of
said distortion; and

combining the source digital images without further correction of said perspective
distortion to form a composite digital image.

Claim 28 [Amended] A method of generating a composite digital image, said method
comprising:

projecting an optical image of a scene on an image sensor having a planar surface, said
optical image having a perspective distortion relative to said planar surface, said perspective
distortion being inherent in geometry of said projecting on said planar surface, said image sensor
having a plurality of imaging elements, said imaging elements being located according to a ~~non-~~
~~linear distribution representable by a projection of the scene onto a non-planar surface;~~
distribution representable by a nonlinear function in which relative density of the
distributed imaging elements is greater toward the center of the sensor, wherein the
distribution provides physical coordinates for each of the imaging elements corresponding
to a projection of the scene onto a non-planar surface,

wherein said distribution of imaging elements on said surface compensatory
compensates for said perspective distortion; and

generating a digital image corresponding to said optical image using said image sensor
said digital image having a plurality of pixels, each said pixel corresponding to a respective one
of said imaging elements, said pixels being in a uniform rectilinear array free of said perspective
distortion.

Claims 30-32 CANCELED

Claim 35 [Amended] A method of generating a composite digital image, said method
comprising:

receiving a perspective projection of a scene onto a plurality of imaging elements
defining a plane, said projection having a perspective distortion relative to said plane, said
perspective distortion being inherent in geometry of said projection, said imaging elements being
located in said plane according to a non-linear distribution **wherein relative density of the
distributed imaging elements is greater toward the center of the sensor, wherein the
distribution provides physical coordinates for each of the imaging elements corresponding
to a projection of the scene onto a non-planar surface, representable by a projection of the
scene onto a non-planar surface, and wherein** said distribution being compensatory of said
perspective distortion; and

generating a digital image corresponding to said optical image using said imaging
elements without further correction of said perspective distortion, said digital image having a
plurality of pixels, each said pixel corresponding to a respective one of said imaging elements,
said pixels being in a uniform rectilinear array free of said perspective distortion.

Allowable Subject Matter

2. **Claims 1-12, 23-29, 35, and 36** are allowed.

3. The following is an examiner's statement of reasons for allowance:

Claim 1 is allowed because the prior art does not teach or fairly suggest an electronic imaging system for capturing an image of a scene, said imaging system comprising:

wherein said optical system provides a perspective projection of said optical image onto said surface of said imaging sensor, wherein said optical image has a perspective distortion relative to surface of said imaging sensor, said perspective distortion being inherent in geometry of said perspective projection onto surface of said imaging sensor, and *said distribution of said imaging elements on said surface of said imaging sensor compensates said output image for said perspective distortion, such that said output image is free of said perspective distortion and has said pixels in a uniform rectilinear array*, in combination with the other claimed elements.

Claims 2-12 are allowed because claims 2-12 depend on claim 1.

Claim 23 is allowed because the prior art does not teach or fairly suggest a method of generating a composite digital image from at least two source digital images, said method comprising:

providing a perspective projection of each of said source optical images onto a planar surface of an image sensor, wherein each of said source optical images has a perspective distortion relative to said surface, said perspective distortion being inherent in geometry of said perspective projection onto said surface, said image sensor having a plurality of imaging elements, said imaging elements being located according to a distribution representable by a nonlinear function in which relative density of the distributed imaging elements is greater toward

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the center of the sensor, *wherein the distribution provides physical coordinates for each of the imaging elements corresponding to a projection of the scene onto a non-planar surface wherein said distribution of imaging elements on said surface compensates for said perspective distortion*; in combination with the other claimed elements.

Claims 24-27 are allowed because claims 24-27 depend on claim 23.

Claim 28 is allowed because the prior art does not teach or fairly suggest a method of generating a composite digital image, said method comprising:

projecting an optical image of a scene on an image sensor having a planar surface, said optical image having a perspective distortion relative to said planar surface, said perspective distortion being inherent in geometry of said projecting on said planar surface, *said image sensor having a plurality of imaging elements, said imaging elements being located according to distribution representable by a nonlinear function in which relative density of the distributed imaging elements is greater toward the center of the sensor, wherein the distribution provides physical coordinates for each of the imaging elements corresponding to a projection of the scene onto a non-planar surface,*

wherein said distribution of imaging elements on said surface compensatory compensates for said perspective distortion, in combination with the other claimed elements.

Claim 29 is allowed because claim 29 depends on claim 28.

Claim 35 is allowed because the prior art does not teach or fairly suggest a method of generating a composite digital image, said method comprising:

receiving a perspective projection of a scene onto a plurality of imaging elements defining a plane, said projection having a perspective distortion relative to said plane, said

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perspective distortion being inherent in geometry of said projection, said imaging elements being located in said plane according to a non-linear distribution wherein relative density of the distributed imaging elements is greater toward the center of the sensor, *wherein the distribution provides physical coordinates for each of the imaging elements corresponding to a projection of the scene onto a non-planar surface, and wherein said distribution being compensatory of said perspective distortion, in combination with the other claimed elements.*

Claim 36 is allowed because claim 36 depends on claim 35.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Carramah J. Quiett whose telephone number is (571) 272-7316. The examiner can normally be reached on 8:00-5:00 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NgocYen Vu can be reached on (571) 272-7320. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

CJQ

January 16, 2007

A handwritten signature in black ink, appearing to read 'Ngo Yen Vu', with a long horizontal flourish extending to the right.

NGOO YEN VU
SUPERVISORY PATENT EXAMINER